Wrinkles, folds and calcifications: reduced durability after transcatheter aortic valve-in-valve replacement

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Transcatheter valve-in-valve implantation is an acceptable alternative therapy for failed aortic or mitral bioprostheses in selected patients.[1-3] With improved survival, durability of transcatheter valves becomes increasingly important because early structural failure frequently requires complex surgery.[4]

Figure 1 shows a self-expandable transcatheter aortic valve (CoreValve, 23 mm; Medtronic, Minneapolis, Minn) implanted through transfemoral access in a stented bioprosthesis (Sorin Mitroflow, 21 mm; LivaNova PLC, London, United Kingdom) 3 years previously (Figure 1, A, andVideo 1), leading to an effective aortic valve area of 1.5 cm^2 and a reduction of the mean transvalvular gradient from 50 to 31 mm Hg initially. This valve was explanted (Figure 1, B, CoreValve-Mitroflow-corpus) because of severe aortic valve stenosis.

Effective orifice area of the valve was 0.8 cm^2 (mean transvalvular gradient, 48mmHg), as determined by preoperative echocardiography. The following findings were revealed by structured examination of the explanted transcatheter valve. Wrinkled pericardium at the outflow aspect (Figure 1, B) and inflow aspect (Figure 1, C) of the prosthesis, an ovalized, noncircular cross-sectional profile (Figure 1, D),

and deep folds at each leaflet (Figure 1, B, C, and D) were indicative of an incomplete prosthesis expansion. Radiographic examination demonstrated multiple calcifications at all leaflets (Figure 1, D). Apparently, deposition of calcium started within the leaflets (Figure 1, E); these deposits evolved into vegetating calcifications (Figure 1, B and C) and were present in all leaflets at the inflowside (Figure 1, C) and in 2 of 3 leaflets at the outflow side (Figure 1, B). Altered collagen bundles, a bubbly tissue texture, and pericardial delamination were associated with leaflet folds (Figure 1, F) and may represent early stages of bioprosthetic degeneration.
Because of the risk of accelerated structural degeneration, incomplete prosthesis expansion as a result of oversizing has to be prevented when performing transcatheter valve-in-valve procedures, especially for failed stented bioprostheses in the aortic position. The true internal diameter should be used for selecting an appropriate transcatheter heart valve device.[5]

References

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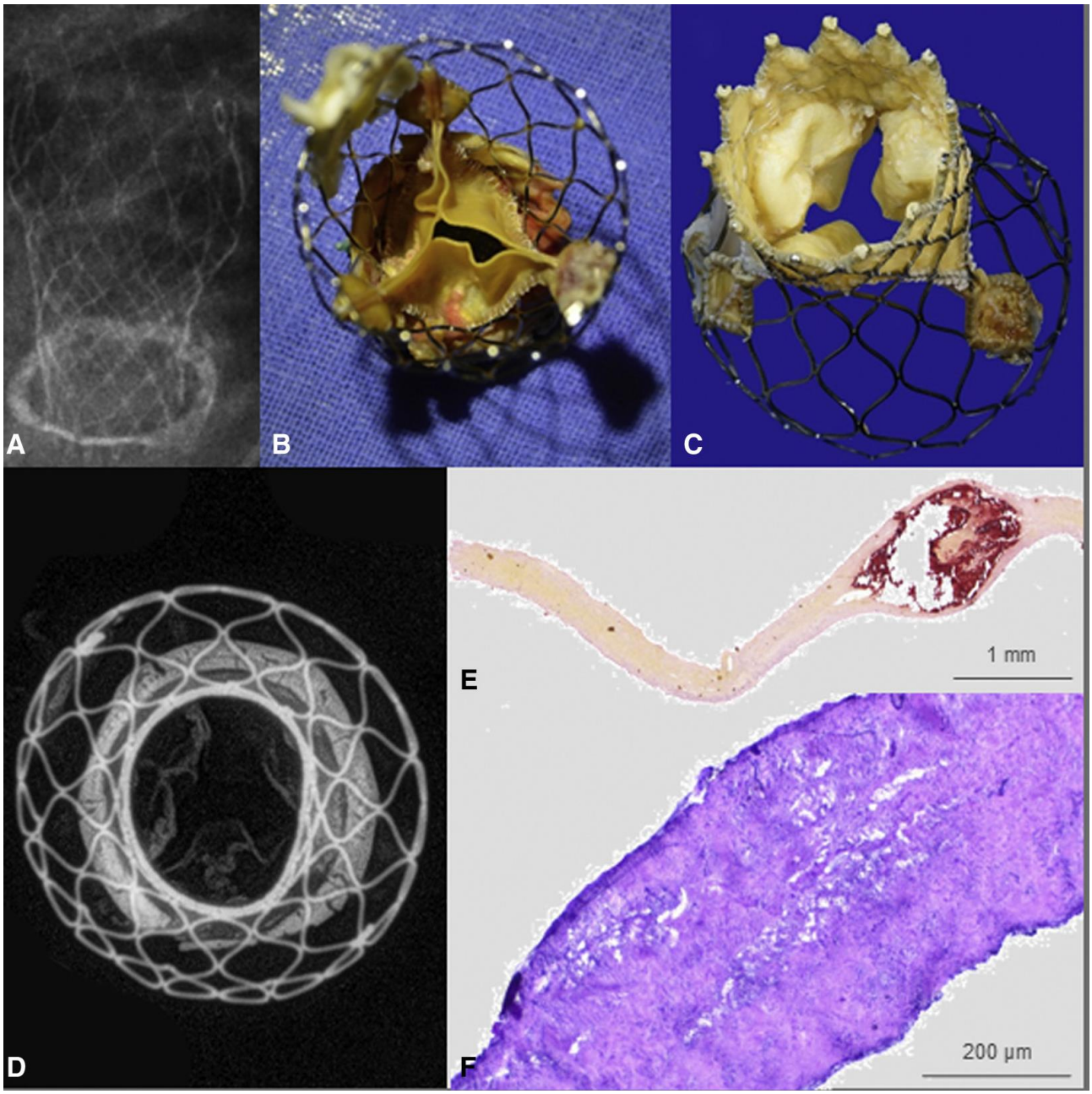

FIGURE 1. Early structural failure after transcatheter aortic valve-in-valve replacement. A, Section of patient's chest radiograph showing a 23-mm Core Valve transcatheter valve (Medtronic, Minneapolis, Minn) within a 21-mm Mitroflow conventional stented bioprosthesis (LivaNova PLC, London, United Kingdom). B, The explanted CoreValve-Mitroflow-corpus presenting pericardial folds and vegetating calcifications at the outflow aspects. C, Wrinkled pericardium and calcifications at the inflow aspect of the explanted CoreValve prosthesis. D, Radiographic examination demonstrates an ovalized, noncircular cross-sectional profile of the transcatheter valve within the stented bioprosthesis, as well as multiple calcifications at all leaflets of the CoreValve prosthesis.
E, Alizarin red staining of a leaflet fold with intrinsic calcium nodule (3-fold magnification). F, Hematoxylin-eosin staining of a leaflet fold showing homogenized and locally disrupted collagen bundles, a bubbly tissue texture, and pericardial delamination (20-fold magnification).

VIDEO 1. Fluoroscopy demonstrating the degenerated 21-mm Mitroflow prosthesis (LivaNova PLC, London, United Kingdom) and the valve-in-valve procedure with a 23-mm CoreValve prosthesis (Medtronic, Minneapolis, Minn). Video available at: http://www.jtcvsonline.org/article/S0022-5223(16)31037-6/addons.